

Surfactant Assisted Growth of Giant Magnetoresistance Multilayers

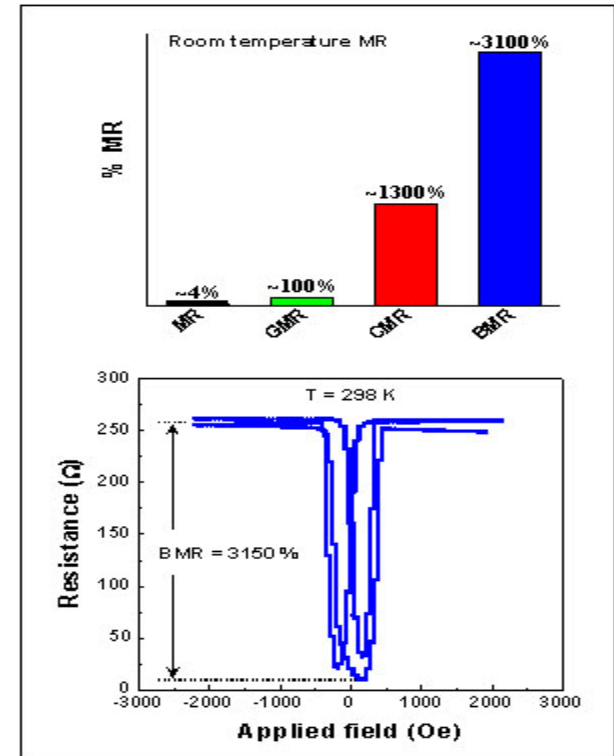
Harsh Deep Chopra, SUNY-Buffalo, Award# NSF-DMR-97-31733

From Nano-Sized Sensors to Mini Supercomputers

- ❖ A remarkably sensitive magnetic sensor developed using an effect called “ballistic” magnetoresistance or simply, BMR.
- ❖ Sensor only a few atoms in size and changes its electrical resistance by over 3000! in small magnetic fields – fields normally associated with stored bits of data in computers.
- ❖ Developed technology drastically improves upon existing data storage sensors by a factor of over 30!
- ❖ Would enable terabit per inch square (a million million bits per square inch) – wristwatch sized supercomputers!! Equivalent of 50 2-hour DVD movies instead of one currently possible in a comparably sized hard disk.
- ❖ Other applications include fundamental measurements of magnetism in atoms, molecules, imaging techniques, etc.

Harsh Deep Chopra and Susan Z. Hua, *Physical Review B*, vol. 66, pp. 020403(R) (2002).

Significance of Research highlighted by: NSF, American Institute of Physics, US Department of State, Science, ScienceNews, Physics World, American Association for the Advancement of Science, and other organizations worldwide.



Relative magnitude of existing sensors (above figure) vs the developed BMR sensor. An actual graph of BMR sensor showing 3150% change in electrical resistance (lower figure) in a small magnetic field at room temperature.

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Training, Outreach, Awards and Honors

- ❖ Several graduate, undergraduate, as well as minority high school students, and women have and are benefiting by working on various aspects of the ongoing NSF sponsored research.
- ❖ Following NSF sponsored papers highlighted as "Frontier Research" in *Virtual Journal of Nanoscale Science & Technology*; <http://www.vjnano.org>
 1. H. D. Chopra and Susan Z. Hua, *Physical Review B*, Vol. 66, 020403 (2002).
 2. H. D. Chopra, D. X. Yang, P. J. Chen, and W. F. Egelhoff, Jr., *Physical Review B* **65**, 0944331 (2002).
 3. D. X. Yang, B. Shashishekar, H. D. Chopra, P. J. Chen, and W. F. Egelhoff, Jr., *Applied Physics Letters* **80**, 2943 (2002).
- ❖ Honored as a "Promising Inventor" by SUNY Chancellor R. L. King on NSF related work.
- ❖ National Science Foundation Special Creativity Award.
- ❖ American Institute of Physics' William F. and Edith R. Meggers Award towards "*An initiative to enhance physics education in Buffalo-area inner city high schools & to highlight the social permeation of physics*", 1998-1999.
- ❖ Founder of Magnetronix, Inc, a startup company. It aims to develop devices for data storage, magnetic sensors, and non-destructive testing equipment.